

**Biospheric Sciences Branch Highlights**  
**Code 614.4**  
**May – June 2006**

● **Science policy meetings, Science team meetings, Workshops**

**\*\*** Jack Xiong, Steve Ungar, Jeff Privette, and Jim Butler from 614.4 attended the ASIC<sup>3</sup> (Achieving Satellite Instrument Calibration for Climate Change) Workshop at the National Conference Center, Lansdowne, VA, May 16-18. During the agency roles session, Jack Kaye (NASA Headquarters) gave a presentation on Cal/Val and Continuity of Environmental Observations.

**\*\*** J. Ranson and J. Collatz visited with NASA HQ Program Managers Diane Wickland and Bill Emanuel regarding scope and funding for a Carbon Cycle and Ecosystem Office on May 22, 2006. This office will provide support for the CC&E focus area by facilitating exchange of program information with the scientific community through a web site, helping define and lead science team meetings and providing HQ with requested program information.

**\*\*** Jim Irons (Code 614.4) in India to meet with Indian Space Research Organization (ISRO)

Jim Irons traveled to India (June 10 - 20) with a contingent including three people from NASA HQ (Ed Grigsby, Ed Scheffner, and Liz Williams), two from USGS EROS (Gregg Stensaas and Gyanesh Chander), and one from USDA (Brad Doorn). The purpose of the trip was to meet with scientists and engineers from the Indian Space Research Organization (ISRO) regarding the suitability of data from instruments aboard the ISRO RESOURCESAT-1 satellite as an alternative to Landsat data. The nation will likely face a gap in Landsat data acquisition between the end of life for the Landsat 5 and Landsat 7 satellites and the launch of the Landsat Data Continuity Mission (LDCM). NASA HQ formed an interagency Landsat Data Gap Study Team to develop strategies for mitigating the impact of a data gap. The contingent traveled to India for fact finding about the performance and operation of the RESOURCESAT-1 satellite and its three earth observing sensors.

**\*\*** Code 614 personnel participated in a telecon with US Forest Service headquarters and program leaders on June 1, 2006. This is a follow on to meetings held at GSFC and USFS in February and April of this year. The subject was potential projects where NASA can bring to bear its technology on Forest Service problems. The lead USFS person is Dr. Susan Stein, Manager of the Forest on the Edge Program.

**\*\* Jack Xiong (614.4) attended the 2006 Joint Assembly (AGU) at Baltimore, May 23-26 and presided over a session (B51A) on Post-launch Calibration and Validation of Earth Observing Sensors (with Dr. C. Cao of NOAA/NESDIS).**

- **Funded Research**

**\*\* Specific Cooperative Agreement (SCA) with the USDA-ARS Center signed**

The GIMMS Group, Biospheric Sciences Branch, Code 614.4, has signed a Specific Cooperative Agreement (SCA) with the USDA-ARS Center for Medical, Agricultural & Veterinary Entomology (CMAVE), Gainesville, Florida. Through this agreement CMAVE and GIMMS will collaborate in using remotely sensed satellite data to develop an early warning system to detect conditions for elevated populations of potential vectors of Rift Valley Fever (RVF) and other mosquito-borne emerging virus threats in the United States. The primary objective is early detection of environmental conditions which could precipitate a mosquito transmitted arbovirus, providing decision support for Agricultural and Public Health officials to implement agricultural and medical planning for potential containment and control operations.

- **Significant Activities**

**\*\* Bob Knox and Jonathan Rall's concept (patent application pending) offered as opportunity for NASA technology transfer**

Robert Knox's (Code 614.4) "Spectral-Ratio Biospheric Lidar" concept (patent application pending) has been offered as a featured opportunity for NASA technology transfer.

(See <http://tco.gsfc.nasa.gov/ft-tech-multi-wave-lidar.html>).

Jonathan Rall and Bob Knox demonstrated measurement fundamentals, using a breadboard instrument that incorporated some key features of the invention. The laboratory system was developed originally with support from the Biospheric Sciences Branch (2001-2003).

**\*\* Anyamba participates in a field work mission in Kenya**

Assaf Anyamba (614.4) recently participated in a five-week, two part fieldwork mission (March 27- April 30, 2006) in Kenya. The first part of fieldwork involved the construction of a Remote Sensing and Weather tower to validate measurements from the METEOSAT Second Generation (MSG) satellite currently in operation. This work was carried out in collaboration with Dr. Rasmus Fensholt (Institute of Geography, University of Copenhagen, Denmark), Dr. Christopher Shisanya (Kenyatta University,

Nairobi, Kenya) and Kenya Wildlife Service (KWS). The tower is equipped with several instruments to measure wind speed, air temperature and relative humidity, shortwave and longwave radiation, surface temperature, soil moisture and temperature, and rainfall. The tower is co-located with an AERONET instrument at the Nairobi National Park (NNP) and will be in operational for three years. This site adds to the existing network of MSG validation sites in Senegal, Mali and Sudan. The second part of the fieldwork involved field studies on mosquito vector ecology and identification of potential sites for testing of mosquito control measures currently under development by USDA-Center for Medical, Agricultural & Veterinary Entomology (USDA-CMAVE, Gainesville, Florida). This work was carried out in collaboration with Dr Kenneth Linthicum (CMAVE) and Major Jason Richardson (US Army Medical Research Unit – Kenya). This work supports a global epidemiological surveillance and response network of the DoD's Global Emerging Infections Surveillance & Response System (GEIS).

**\*\* Biospheric Sciences (Code 614.4) personnel participate in educational workshop**

Eric Brown de Colstoun, Anita Davis, Jeannie Allen (all SSAI/Code 614.4) and Izolda Trakhtenberg (GLOBE/Code 614.4) organized a two-day educational workshop entitled "Bridging the GAPS from Space: How to use NASA Satellite Data in the Classroom" in Archbald, PA May 2-3, 2006. Participant evaluations indicated a highly successful workshop.

The workshop was jointly organized by the Landsat Education and Public Outreach program, and the Northeastern and Colonial Intermediate Units from the State of PA, and brought together over 30 participants including middle and high school science/geography teachers, education staff from two national parks, and the GLOBE program. The objectives of the workshop were to introduce the educators to the GLOBE biometry and land cover field measurements protocols that will be used to validate Landsat-based tree cover and impervious cover data sets for the Upper Delaware Basin. The second day introduced the teachers to basic concepts of remote sensing, image processing, and provided materials for use in the classroom. Teachers were encouraged to develop and discuss their ideas for classroom implementation of satellite remote sensing and land cover change monitoring from satellites.

**\*\* Dr. Marc Imhoff gave two invited keynote addresses in Vancouver, Canada next week as part of the 2006 British Columbia Society of Landscape Architects/Council of Educators Conference. His first address entitled, "Gray Wave of the Great Transformation: A Satellite View of Urbanization, Climate, and Food Security," was presented during the opening session of the Shifting Ground: Landscape Architecture in the Age of the New Normal (June 14). The conference theme is intended to explore the role of the landscape architecture and professional education within the context of contemporary**

local and global issues and will coincide with the UN World Urban Forum III that is being hosted by Canada in Vancouver immediately following the Conference. Dr. Imhoff's second address entitled, "Planetary Secrets: The Secret Lives of Storms, Deserts, and Fires", was presented on Saturday June 17 at Super Saturday - a day of inter-disciplinary events in collaboration with the Architectural Institute of BC/Royal Architectural Institute of Canada and the Planning Institute of BC/Canadian Institute of Planners. More than 2,000 delegates attended.

**\*\* Landsat Calibration Working Group Meeting Summary 5/31 - 6/1/2006**

NASA and USGS work jointly to insure the radiometric and geometric calibrations, both current and historical, of the Landsat-5 TM and Landsat-7 ETM+ are maintained and refined. As part of this effort, NASA funds several external teams that provide independent analyses and perform vicarious radiometric calibrations. Twice yearly, these investigators meet with USGS and NASA personnel to review the current calibrations of these instruments and compare the results from independent methods, including the vicarious calibration results. Recently, this "TM+ calibration working group" met May 31 and June 1 at USGS EROS. Some key results/recommendations presented at the current meeting included:

- 1) The backup scan mirror-operating mode (bumper mode) for the Landsat-7 ETM+ was successfully tested in March this year. This operating mode, already in use on Landsat-5 TM, is anticipated to be needed in approximately 1 year on Landsat-7 ETM+ due to wear of the scan mirror bumpers. A more rigorous model was shown to be needed to process Landsat-7 ETM+ and was used to successfully process Landsat-7 ETM+ bumper mode data.
- 2) The Landsat-7 ETM+ reflective band radiometric calibration gains continue to be stable to an uncertainty of several tenths of a percent per year. No changes were recommended.
- 3) The Landsat-7 ETM+ thermal band radiometric calibration continues to be accurate to within the ability to assess using vicarious calibration, circa  $\pm 1\%$ , across the temperature range of about  $0^{\circ}$  to  $20^{\circ}$  C. There is some indication that at higher temperatures the calibration deviates from the vicarious calibration measurements. More warm target validations will be conducted this summer in an attempt to resolve this uncertainty.
- 4) The Landsat-5 TM bumper mode calibration was shown to be less stable recently due to some perturbations introduced by the solar array drive anomaly. These perturbations required more frequent bumper mode calibration updates.
- 5) The Landsat-5 TM reflective bands radiometric calibration is currently based on a model developed from the internal calibrator and a cross calibration to ETM+. Data acquired from 1984 to present over a Saharan desert site, recently made available by the European Space Agency, suggests that the first half of the instruments history deviates from this model, at least in bands 1 and 2 and perhaps bands 3 and 4 to a lesser extent. A tiger team

was formed to reexamine all the data and come up with a recommendation by the next calibration meeting.

6) The Landsat-5 TM thermal band data continues to show a bias that averages about 1° C from the vicarious data, at least since these data have been rigorously monitored following the launch of Landsat-7 in 1999. The group recommended adjusting for the bias in the Landsat-5 TM processing for the period of 1999 to present and analyzing any older data that can be obtained to see if this bias has been present for a longer period. This calibration update should take place in the next several months.